

raising properties. This apparently little known relationship has been overlooked by a number of writers who continue to list cocoa butter (or chocolate) as a saturated fat that raises serum cholesterol levels.

Third, the authors state that removing chicken skin before cooking decreases the fat that penetrates the lean tissue, but add, "This is not true for turkey; therefore, the skin does not need to be removed before cooking." Since cooked turkey skin is 84% fat,² by calories, it seems unlikely that this fat would not also penetrate the lean tissue as it does in chicken.

The distortions or misrepresentations (which I have no reason to suspect are intentional) concern the discussion and listing (in Table 2) of the percent of fat in meat, poultry and seafood. Instead of considering fat content of these foods as percent of total calories, the fat content is listed as percent by weight. The latter gives the impression of a distinctly lower quantity of fat (than is actually there)—see Table 1. Reading the percent of fat by weight tends to give readers a false sense of security when consuming any of the items listed.

Though I would emphasize that I agree with the authors' general advice, I do take issue with the statement, "If lipids reach an acceptable level with only a moderate restriction of fat and cholesterol, that is the level at which a person should

be maintained, not a more restricted one." First, "acceptable level" is vague and therefore not very helpful. Though the acceptable level is clearly debatable, I think that most now agree that it is well below the 90th percentile figures which the authors describe as "the upper limits of normal." Second, it has become apparent that reducing fat in the diet is likely to reduce several kinds of cancer risk (as well as several other pathologic conditions).^{4,5} Therefore, advising maintenance of only moderate fat restriction as long as cholesterol levels are acceptable denies the patient the other potential benefits that a more restricted fat intake can provide.

Finally, as noted by the most recent American Heart Association joint statement of the Nutrition Committee and the Council on Arteriosclerosis (of which Dr Gotto was a member), "There is the possibility that people whose cholesterol levels are at the upper end of the putative desirable range may still be at higher risk for coronary heart disease than those at the lower end; if so, a maximal reduction of levels may be beneficial."⁶ They added, "The recommended diet may reduce risk in ways that are not reflected in plasma lipid values; saturated fats and dietary cholesterol possibly have adverse effects on lipoprotein metabolism not revealed in fasting lipid levels."

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TABLE 1.—Percent of Fat in Meat, Poultry and Seafood (by Weight, as Represented by Gotto, and by Calories, as Calculated by Freedman)

	Percent Fat (by weight)	Percent Fat (by calories)
Seafood		
Clams, raw	2.5	21
Flounder, raw	0.8	9
Haddock, raw	0.1	10
Salmon, pink (humpback), raw	3.7	28
Snapper, red and gray, raw	0.9	9
Shrimp, raw	0.8	8
Tuna, water packed	0.8	6
Tuna, oil packed	8.2	37
Poultry		
Chicken, light meat, no skin, roasted	4.5	18
Chicken, dark meat, no skin, roasted	9.7	32
Chicken, light and dark meat with skin, roasted	13.6	53
Turkey, light meat, no skin, roasted	3.2	20
Turkey, dark meat, no skin, roasted	7.2	37
Turkey, light and dark meat, with skin, roasted	9.7	39
Beef		
Flank, round (lean only), cooked	6.1	29
Chuck, porterhouse, T-bone (lean only), cooked	10.3	42
Ground beef, regular, cooked	20.3	64
Lamb		
Shoulder (lean only), cooked	9.6	47
Pork		
Ham (lean only), cooked	9.0	39
Spareribs (lean and fat), cooked	35.1	77
Luncheon Meat and Sausage		
Bologna, beef	28.4	74
Italian sausage, cooked, pork	25.7	76
Pepperoni, pork and beef	43.9	83
Salami, dry, pork	33.7	76
Summer sausage, beef and pork	29.9	76

*Percent fat by calories calculated by multiplying grams of fat/100 grams edible portion times 9 (approximate calories/gram) divided by total calories/100 grams edible portion, then multiplying result times 100.

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Dr Gotto and Ms Scott Reply

TO THE EDITOR: In his letter to the editor, Dr Gerald C. Freedman describes "factual errors," "distortions" and "misrepresentations" in our article, "Diet and Health." He has raised several highly technical points and in every instance we believe that he is wrong. We do agree with him concerning the vagueness of the phrase "acceptable lipid level," however.

Dr Freedman raises the issue of how to interpret data on the fat content of food. It can be presented as either percent by weight or percent of calories. In relative terms, comparable results are achieved—that is, in a list showing fat content in descending order, by either method, the same foods appear first, second, third and so forth. Fat content by weight is the accepted format. The US Department of Agriculture often uses this method for classifying foods. It is used by meat and dairy companies for identifying fat content (1% fat milk, 96% fat-free meat). Most diet materials are written to teach the consumer to use percent fat (by weight) with nutrition labeling. Of course, the numbers are lower with percent per weight than with percent of calories. Both systems require education for use.

Seafood is classified by the US Department of Agriculture

according to percent fat by weight (100 grams), not percent calories from fat.¹ The low-fat fish category ranges from less than 1% fat to 5% fat. Medium-fat fish is 6% to 15% and over 15% is high-fat fish. According to this classification, cod, haddock, flounder, ocean perch and most species of tuna are "low-fat." Mackerel, albacore tuna and most species of salmon are in the medium-fat group. Eel, seer mackerel and chinook salmon are high-fat fish. Herring ranges from 4.4 to 16.4 grams fat per 100 grams. Shellfish falls in the low-fat category, having total lipid ranging from less than 1% to 3.6% fat.

The article states that seafood provides less fat per gram of protein than poultry, beef or pork. This is true for shellfish and low-fat fish, which make up most of the seafood consumed. The ratio of fat to protein is 0.005 to 0.16 for low-fat, 0.33 to 0.65 for moderate-fat and 0.82 to 1.15 for high-fat fish.¹ Chicken ranges from 0.15 to 0.5, beef 0.19 to 2.07 and pork 0.39 to 1.03. Recent studies have shown that fish oil is rich in ω -3 fatty acids and lowers plasma triglycerides and cholesterol in some instances. Harris and co-workers^{2,3} showed that when normal subjects ate salmon filets and salmon oil, total cholesterol and triglyceride decreased 11% to 17% and 34% to 40%, respectively, over four weeks. Salmon and mackerel, high-fat fish, are good sources of ω -3 fatty acids. Although "technically" high-fat fish does not have less fat per gram of protein than poultry, beef and pork, it is still the "preferred choice" on lipid-lowering diets.

Cocoa butter is a saturated fat by structure. It contains 59.6 grams of saturated fat in 100 grams total fat, with 33.2 grams provided by stearic, 31.6 grams from oleic and 25.4 grams from palmitic.⁴ Grande and associates compared the effects of cocoa butter and palm kernel oil with "imitation cocoa butter" and "imitation palm kernel oil." The mean serum cholesterol levels were 203 ± 29 , 199 ± 29 , 217 ± 34 and 193 ± 31 mg per dl for cocoa butter, imitation cocoa butter, palm kernel oil and imitation palm kernel oil, respectively. The imitation cocoa butter consisted of palm oil, hydrogenated soya-bean oil (mostly stearic), olive oil and safflower oil yielding the same fatty acid composition as cocoa butter. Since the cocoa butter and the imitation cocoa butter gave similar results, the effects on serum cholesterol were due to the fatty acid composition and not to some peculiar property of cocoa butter. McGandy and Hegsted⁵ concluded from their review of several studies that "the data support the thesis that stearic acid has less effect upon serum cholesterol than lauric, myristic, or palmitic acids, but do not support the contention that it is completely without effect under most conditions."

In reference to Dr Freedman's comment about removing skin on chicken before cooking and not removing turkey skin before cooking, we used Agriculture Handbook No. 8-5 on poultry products.⁶ When chicken is cooked with skin, by dry heat, retention is 192% total lipid, whereas for turkey it is 128% total lipid. According to Posati (L. P. Posati, US De-

partment of Agriculture, oral communication), there is so little transfer of fat from the skin on turkey that it is not advisable to remove it before cooking because of the "drying" of the meat that could occur. Feely and associates⁷ say, "there would seem to be no advantage in cooking turkey meat without skin, as the cholesterol does not appear to transfer from skin to meat during cooking." Skin on turkey should, however, be removed before it is eaten. Chicken skin is 32.4% fat, and turkey skin is 36.9% fat.⁶

We agree with Dr Freedman that "acceptable lipid level" is vague. But, it is well below the 90th percentile. Since the time our paper was written, the National Institutes of Health held a consensus conference on lowering serum cholesterol levels. The committee agreed that "review of all available data suggests that levels above 200 to 230 mg/dl represent values above which most would agree that there is an increased risk of developing premature coronary heart disease." They further define "high risk" and "moderate risk" as shown in Table 1.

TABLE 1.—High Risk and Moderate Risk Serum Cholesterol Levels, as Defined by National Institutes of Health Committee

Age Years	Moderate Risk mg/dl	High Risk mg/dl
2-19	>170	>185
20-29	>200	>220
30-39	>220	>240
40+	>240	>260

Moderate risk values are approximately between the 75th and 90th percentiles and high-risk the 90th percentile, as determined by the Lipid Research Clinics Prevalence Study.⁸

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